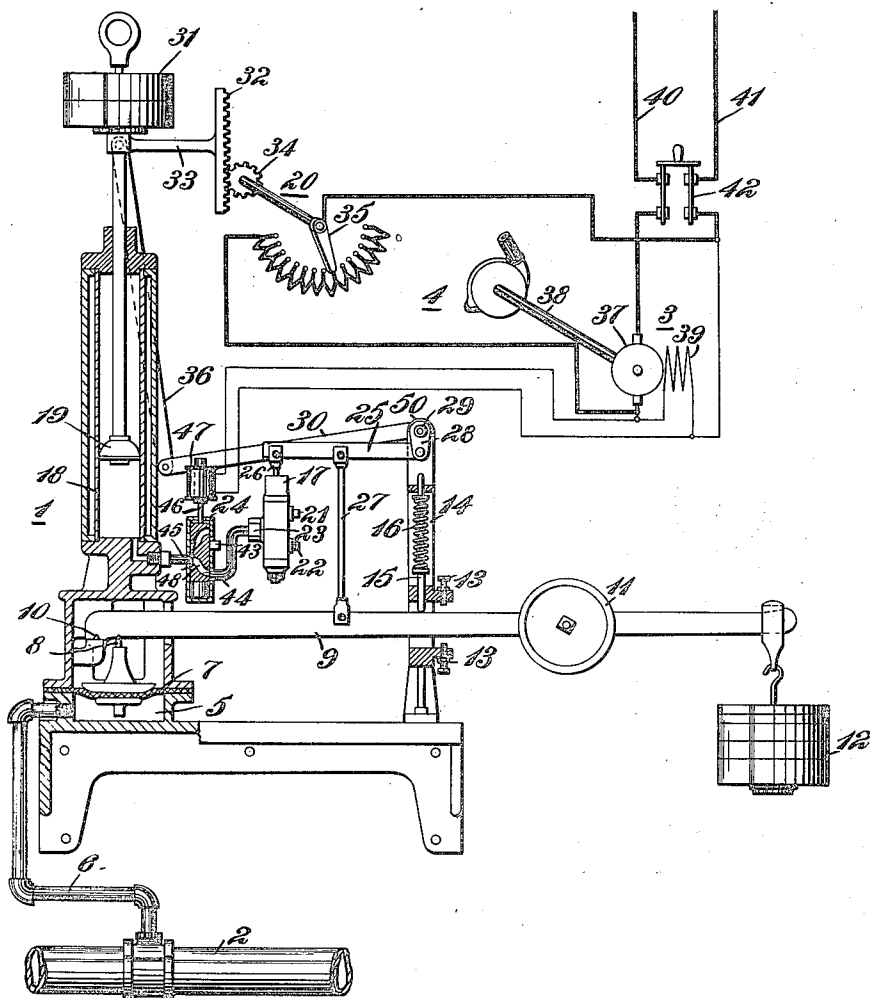


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A. L. HARVEY.
FLUID PRESSURE REGULATOR.
FILED SEPT. 24, 1920.



WITNESSES:

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FLUID-PRESSURE REGULATOR.

Application filed September 24, 1920. Serial No. 412,584.

To all whom it may concern:

Be it known that I, ALBERT L. HARVEY, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fluid-Pressure Regulators, of which the following is a specification.

My invention relates to fluid-pressure regulators and particularly to regulators for governing the steam pressure of boilers.

One object of my invention is to provide a fluid-pressure regulator that shall operate a motor directly in accordance with the pressure to be regulated and that shall be rendered inoperative upon failure of the power supplied to the motor.

Another object of my invention is to provide a regulator of the above-indicated character that shall so govern the flue draft of a boiler as to maintain the steam pressure of the boiler substantially constant.

In operating many regulator systems, it is desirable to render the controlling means of a regulator inoperative upon failure of the power means which is controlled by the regulator means. Thus, in a system wherein the flue draft is regulated in accordance with the pressure of the steam in the boiler, it is desirable to render the blower-motor-controlling means inoperative upon failure of the blower motor.

In a pressure regulator constructed in accordance with my invention, a fluid-pressure device is controlled directly in accordance with the pressure obtaining in the boiler to be regulated. The pressure device operates a rheostat which is included in the circuit of the pump motor. A magnet valve, which is connected to the circuit of the pump motor, serves to render the fluid-pressure device inoperative upon failure of the supply circuit, which is connected to the pump motor. Moreover, upon de-energization of the magnet, the fluid-pressure device so operates the rheostat as to insert all resistance in circuit with the motor.

Although I have illustrated my invention for governing the steam pressure of a boiler by controlling the flue draft of such boiler, I do not desire my invention to be limited to such operation. My invention is equally applicable for controlling the stoker motors of a boiler and, moreover, the invention is

equally applicable to a hydraulic system for maintaining the fluid pressure in such system substantially constant.

The single figure of the accompanying drawing is a diagrammatic view of a regulator constructed in accordance with my invention.

Referring to the drawing, a fluid-pressure device 1 is operated in accordance with the pressure obtaining in a fluid system 2 for controlling the operation of a motor 3 and a pump 4. The fluid system 2 may be connected to a steam boiler or a main included in a hydraulic system. The pump 4 may be utilized for varying the flue draft of a boiler or may be connected directly to the hydraulic system, in case a hydraulic system is being regulated. In describing my invention, the pump 4 will be assumed to be operated for varying the flue draft of a boiler and the fluid system 2 will be assumed to be directly connected to a steam boiler.

The fluid-pressure device 1 comprises a pressure chamber 5, which is connected to the fluid system 2 by a pipe 6 and is covered by a diaphragm 7. The diaphragm 7 operates a pin 8 directly in accordance with the pressure obtaining in the chamber 5, and the pin 8 operates a weighted lever 9. The lever 9 is pivotally mounted at 10 and carries two adjustable weights 11 and 12 for adjusting the operation of the pressure device. Two screw members 13, which are mounted in a supporting bracket 14, serve to limit the movement of the lever 9. A pin 15, which is mounted on the bracket 14, is biased downwardly by a spring member 16 for exerting a force on the lever 9 in opposition to the force exerted on such lever by the pin 8 and the diaphragm 7.

A fluid valve 17, which is controlled by the lever 9, is provided for admitting fluid pressure to a cylinder 18. The cylinder 18 operates a piston 19 which, in turn, operates a rheostat 20. The rheostat 20 is included in the circuit of the motor 3. The valve 17 is provided with an inlet port 21, an outlet port 22 and a port 23 which is connected, through a three-way valve 24, to the cylinder 18. The inlet port 21 is connected to any suitable source of fluid pressure.

A valve lever 25, which is connected near one end thereof, to the valve stem 26, is

connected by a link 27 to the main lever 9. The other end of the valve lever 25 is connected to a link 28. The link 28 is supported on an eccentric member 50 which is fixedly mounted on a shaft 29. The shaft 29 is rotatably mounted on the bracket 14 and carries a lever 30 for a purpose to be hereinafter set forth.

The piston 19, which operates within the cylinder 18, carries a weight member 31 for opposing the action of the fluid pressure on the piston 19. A rack member 32 is mounted on the piston 19 by an arm 33 for operating a pinion 34 which is directly connected to the arm 35 of the rheostat 20. A rod 36, which is pivotally connected to the lever 30, is connected to the piston 19 in any suitable manner, in order to effect operation of the shaft 29 and the link 28 in accordance with the movement of the piston 19. The rotation of the shaft 29 and the eccentric member 50 operates the link 28 and changes the fulcrum point of the valve lever 25 in order to so change the setting of the valve 17 as to prevent "hunting" action.

The motor 3 comprises an armature 37, which is mechanically connected by a shaft 38 to the pump 4, and a field-magnet winding 39. The armature 37 is electrically connected, through the rheostat 20, to a supply circuit comprising conductors 40 and 41. The field-magnet winding 39 is also connected to such conductors. Any suitable switch 42 is provided in the circuit of the motor.

The three-way valve 24 is provided with an exhaust port 43, an inlet port 44 and a port 45 which is connected to the cylinder 18. A piston 46, which is operated by a magnet 47, is provided with two passageways 48 for connecting the port 45 either with the inlet port 44 or with the outlet port 43. When the magnet 47 is energized and the piston 46 is raised, as shown in the drawing, the port 45 is directly connected to the inlet port 44. However, when the magnet 47 is de-energized, the piston 46 is lowered and the port 45 is connected to the outlet port 43 to exhaust fluid pressure contained within the cylinder 18. The electromagnet 47 is electrically connected across the supply circuit comprising the conductors 40 and 41.

If the pressure in the fluid system 2 is raised above normal value, the diaphragm 7 is raised for operating the main lever 9. The upward movement of the lever 9, by means of the link 27 and the lever 25, operates the valve stem 26 to exhaust the fluid pressure from the cylinder 18. The piston 19 is lowered and the rack and pinion 32 and 34 effect movement of the rheostat arm 35 in a counter-clockwise direction to increase the resistance included in circuit with the motor 3. Thereupon, the speed of the motor 3 and, also, of the pump 4, is re-

duced to change the flue draft on the boiler (not shown) which, in turn, varies the steam pressure in the fluid system 2. If a hydraulic system is being controlled by the regulator, the pump 4 would directly control the pressure obtaining in the system 2.

During the downward movement of the piston 19, the rod 36 and the lever 30 effect a small movement of rotation of the shaft 29 in a counter-clockwise direction. Such movement of the shaft 29 changes the setting of the valve 17 to prevent "hunting" action. That is to say the initial operation of the valve stem 26 has been in a direction to exhaust the cylinder 18 thereby permitting the piston 19 to descend. As the piston 19 descends certain mechanism is actuated to move the valve stem 26 in the opposite direction, which action will change the setting of valve 17 so as to terminate the regulating action just prior to the attaining of normal pressure conditions. If such "anti-hunting" means were not provided, the fluid-pressure device 1 would overtravel to produce the so-called "hunting" action.

If the pressure in the system 2 is below normal value, the diaphragm 7 is lowered to lower the valve stem 26. Thereupon, the port 23 of the valve is connected to the inlet port 21. The fluid pressure contained within the cylinder 18 is increased, and the upward movement of the piston 19 effects a movement of the rheostat arm 35 in a clockwise direction. The resistance included in the circuit of the motor 3 is reduced to increase the speed of the motor 3 and the work performed by the pump 4.

In case the motor 3 is de-energized by a failure of the supply circuit, the electromagnet 47 is de-energized, and the cylinder 18 is disconnected from the main valve 17 to prevent further operation of the fluid-pressure device. The fluid pressure contained within the cylinder 18 is exhausted through the outlet port 43, and the piston 19 assumes its lowermost position. Such movement of the piston 19 effects movement of the rheostat arm 35, in a counter-clockwise direction, to insert resistance in the circuit of the motor 3. Thus, the motor is protected against a sudden rush of current upon closing of the supply circuit.

Modifications in the mechanism may be made within the spirit and scope of my invention, and such modifications are intended to be covered by the appended claims.

I claim as my invention:—

1. In a fluid-pressure regulator, the combination with a motor-controlling mechanism and a fluid-operated device for governing said mechanism, of a magnet valve associated with said device and adapted to render the device inoperative upon de-energization of the magnet.

2. In a fluid-pressure regulator, the com-

combination with a motor rheostat and a fluid-operated device for governing said rheostat, of a magnet valve connected to said device and adapted to render the device inoperative upon de-energization of the magnet.

3. In a fluid-pressure regulator, the combination with a motor connected to a supply circuit, a rheostat in circuit with said motor, and a fluid-operated device for governing said rheostat, of a magnet valve energized by said supply circuit and connected to said device, said magnet valve serving to render the device inoperative upon failure of the supply circuit.

4. In a fluid-pressure regulator, the combination with a motor and a pump operated by said motor for governing the fluid pressure in a fluid system, of means for controlling said motor in accordance with the pressure obtaining in the fluid system, and means comprising a magnet-operated valve for rendering said controlling means inoperative upon failure of said motor.

5. In a fluid-pressure regulator, the combination with a fluid-pressure system, a motor, and a pump operated by said motor for controlling the pressure of said fluid system, of a fluid-operated device for controlling said motor in accordance with the pressure obtaining in said fluid system, and means for releasing said device from fluid pressure upon failure of said motor.

6. In a fluid-pressure regulator, the combination with a fluid system, a pump for controlling the pressure in said fluid system, and means for operating said pump, of a device operated by fluid pressure for controlling said operating means in accordance with the pressure obtaining in said fluid system, and means for relieving said device of fluid pressure upon failure of said operating means.

7. In a pressure-regulator system, the combination with a pressure system, a pump for

controlling the pressure in said system, a motor for operating said pump, and a fluid-pressure device for controlling said motor in accordance with the fluid pressure obtaining in the pressure system, of means for preventing operation of said device upon de-energization of said motor.

8. In a pressure-regulator system, the combination with a pump for controlling the pressure in a fluid system, a motor connected to a supply circuit for operating said pump, and a fluid-pressure device for controlling said motor in accordance with the fluid pressure obtaining in the pressure system, of means comprising a three-way valve for preventing operation of said device upon failure of the supply circuit connected to the motor.

9. In a fluid-pressure regulator, the combination with a pump for controlling the pressure in a fluid system, a motor for operating said pump, and a rheostat connected in circuit with said motor, of means operated in accordance with the pressure obtaining in said fluid system for operating said rheostat, and a magnet valve for rendering said means inoperative upon failure of the supply circuit connected to the motor.

10. In a fluid-pressure regulator, the combination with a pump for controlling the pressure in a fluid system, a motor for operating said pump, and a rheostat connected in circuit with said motor, of means comprising a fluid-operated device for controlling said rheostat in accordance with the pressure obtaining in said fluid system, and means comprising a magnet valve for rendering said device inoperative upon failure of the supply circuit connected to the motor.

In testimony whereof, I have hereunto subscribed my name this 22nd day of September 1920.

ALBERT L. HARVEY.